Inventory for Amphibians and Reptiles in the NPS Klamath Network: Annual Report 2002

by

R. Bruce Bury, Lawrence C. Gangle III, and Sean Litrakis
USGS Forest and Rangeland Ecosystem Science Center
3200 SW Jefferson Way
Corvallis, Oregon 97331

Prepared for:

Daniel Sarr
Inventory Ecologist
Klamath Network-National Park Service
1512 E. Main
Ashland, OR 97520

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Introduction

Amphibian declines have been documented throughout western North America and include several species in the Klamath region (e.g., Cascades frog, California red-legged frog). Status and trends for reptiles are even less known than amphibians for most Klamath parks. For example, the western pond turtle may also be in decline in parts of the region. The eastern bullfrog is a non-native species that is now common throughout the West and this frog is believed to have detrimental effects on native frogs and the western pond turtle. However, we need empirical evidence to establish cause-and-effect relationships between introduced species and native wildlife. In many cases, we lack basic information on distribution and abundance of resident species of herpetofauna. An analysis of network parks lead to an early decision:

NPS Klamath Network Priority 1: Amphibians and Reptiles. Amphibian declines have been documented throughout western North America and are of management concern in most parks. Most of the parks in the network are significantly deficient in their Level I aquatic and terrestrial herptile inventories. Taxonomic expertise and interagency interest in herpetofauna present opportunities for cost effective inventories across all network parks.

Objectives

(1) To efficiently document the herpetofauna in each park. We will conduct species and habitat-specific surveys for suspected taxa in the better studied parks and to implement more widespread surveys in the less studied parks, such as WHIS and LABE.

(2) To develop distribution and abundance data for species of special concern. We will target species which are suspected to be regionally rare or declining, such as the Cascades frog, California red-legged frog, foothill yellow-legged frog, and western pond turtle, or non-native species which may pose a threat to native species, such as the bullfrog.

(3) To document biodiversity in wetland and aquatic habitats of the parks. We will be working to develop integrated methods for sampling these habitats and sharing information and biophysical data among the different inventory teams.

Survey Design

First, we stratified by major habitat type: terrestrial, pond/lake and stream. Field crews of 2 (rarely 4) biologists surveyed parks during appropriate sampling periods. We concentrated effort at WHIS, LABE and ORCA, with some visits to CRLA. We did one site visit to LAVO.

Park Unit	Season of Sampling
Whiskeytown NRA	Winter, Spring and Summer
Lava Beds NM	Spring, summer
Oregon Caves NM	Spring
Crater Lake NP	Summer
Lassen Volcanic NP	Spring/early summer

Methods

We employed four techniques to locate herpetofauna in the Klamath Network units. This was required because the region has wide variation in climate, landforms, aquatic ecosystems, and vegetation types. Aquatic habitats range from cold, rocky streams that harbor three endemic families of stream amphibians to pond-breeding amphibians. Across a variety of terrestrial habitat with salamanders in disjunctive populations, to xeric uplands (e.g., chaparral) with reptiles adapted to dry, hot conditions.

Time-Constrained Searches (TCS). Terrestrial species were surveyed by TCS, which was the allocation of 2 person-hrs (two people x 1 hr in field). During this time, we systematically searched for amphibians and reptiles over an area of roughly 0.5 ha. We looked for any live animlas on the surface adn turned over cover objects (downed wood, large rocks, etc.) with use of potato rakes. We replaced all objects where found. We surveyed in suitable times for amphibians during cool, wet periods and for reptiles in warm, dry weather.

Linear Hikes. This method was essentially a slow walk cross country or, less often, along trails. Each search was ca. 3 km long from start to finish. Objects are turned over en route, but we tended to stress length of survey over long periods (>5 min) at any object encountered. The concept is to cover a wider swath of habitat than the more intensive TCS method.

Headwater Streams. We employed a tested techniques to sample cold, rocky streams because these are home to up to three endemic families of Northwest amphibians (giant and torrest salamanders, and the tailed frog). For inventory surveys, we spend 20 person-min (two people x 10 min) in three bands ca. 50 m apart.

Largewater Surveys. These resemble linear hikes. We employed 2 person-hrs (two people x 1 hr) along edges of large streams and waters. We scanned the shoreline and looked for any animals in the shallows of waters.

Note: Initially, we attempted to draw 25 random sites from a pool of identified waters inside WHIS. These included headwater and large water streams, and a few other waters (from sites used for bat surveys).

Opportunistic Records.

Some species such as terrestrial species of snakes (e.g., mountain king snakes, California striped racers) were occasionally found dead-on-roads while we travel to sites. Many of these snakes are highly seasonal, habitat specialists or we simply do not know how to regularly locate them in the wild.

Results

We sampled 126 sites in four park units with four methods (Table 1). Most (N = 87) were time-constrained surveys (Table 2), which yielded 500 animals or 5.75 individuals/site or 2.87 animals/person-hr of search effort.

Most sites (57.5%) were in WHIS and also yielded a proportion amount of the animals (55.6%). WHIS had 347 animals: 278 reptiles (5 species of lizards and 11 of snakes) and 69 amphibians (3 species of salamanders and 3 of frogs). Four species of lizards comprised 87.8% of all reptiles

found at WHIS: western fence lizard, 45.7%; western skink, 20.9%; sagebrush lizard, 11.5%; and southern alligator lizard, 9.7%. Uncommon or unusual records included 2 northern alligator lizards (both at higher elevations), 8 sharp-tailed snakes, 1 mountain kingsnake, and 1 common kingsnake. We only found 1 each of the California striped racer and western rattlesnake. Further, WHIS yielded 69 amphibians on these terrestrial sites. We found a good number of treefrogs and ensatina (Table 2), and 2 black salamanders. We even found 1 each of "aquatic" species (the tailed frog and giant salamander) and all were near streams.

TCS sites at Lava Beds NM yielded many western fence lizards (87%) of the reptiles. Then, we found few other species: sagebrush lizards (N=5 and 5%) and western skinks (4%), 2 common racers and 2 striped whipsnakes. No amphibians were located. We found only northern alligator lizards (N =3) and 34 amphibians (mostly ensatina and clouded salamanders) at Oregon Caves NM. Crater Lake NP yielded a few sagebrush lizards, and two species of frogs.

Linear surveys were conducted in 21sites in three park units with most (Table 3). We observed 286 animals or 11.44 individuals/site or 5.74 per person-hr of effort. Most sites (48%) were in Lava Beds NM where we found most of the animals (58.0%); all were reptiles (3 species of lizards and 2 of snakes). Western fence lizards were abundant (87.3% of all reptiles), followed by some sagebrush lizards (9.0%) and skinks (1.8%). We found 2 western rattlesnakes on linear surveys but none on TCS.

Although we did fewer linear surveys at WHIS than at LABE, we caught many species and 107 animals at WHIS: 75 reptiles (3 species of lizards; 3, snakes) plus 32 amphibians (2 species of frogs; 1, salamander). These include some yellow-legged frogs. Surveys at Oregon Caves yielded no reptiles and 13 amphibians (1 species of salamander, the ensatina).

Only at Lava Beds NM, we did 4 drives in warm evenings and nights. These yielded 11 records of gopher snakes, 3 rattlesnakes, and 2 western fence lizards.

Of 25 randomly assigned aquatic sites at WHIS, we found 10 to be dry when we visited in summer or when located on GIS maps with input of park staff. We used the remaining sites with water for our surveys at WHIS.

We conducted 18 stream surveys at two park units with high capture rates (Table 4): N = 172 or 9.56/site (4.77 per person-hr). Most sites (66.6%) were at WHIS and yielded a disproportional number of captures (91.2%). These were predominantly amphibians (N = 153 individuals of 3 species of frogs and 3 species of salamanders; most of the catch was giant salamanders and tailed frogs) and 4 reptiles (2 species of lizards; 2 of snakes). There were few captures in ORCA streams: a total of 6 tailed frogs and 9 giant salmanders in 6 sites sampled.

Discussion and Conclusions

There were marked differences in species in each park unit known from prior literature (Bury 1982, Bury and Corn 1987, Bury and Corn 1991, Olson et al. 1997). For example, the Black salamander only occurred in one unit (WHIS), which is on the eastern flanks of the Calif. Coast Range. Reptiles included common forms such as garter snakes to species with spotty distributions (e.g., sharp-tailed snake, which is surface activity following rains in winter and spring).

We found 22 species of herpetofauna in WHIS, which is the highest diversity we recorded for any of the four park units we visited. In part, we spent more time at WHIS than elsewhere. Still, WHIS has great habitat diversity (elevation, vegetation types, aquatic systems) and, in turn, a wide diversity of species. We did not expect occurrence of tailed frogs at WHIS, but located several new locality records in cool streams flowing off Shasta Bally on the east side of the park. at the other environmental extreme, we documented several records of whiptail lizards and California striped racers in lower elevations in WHIS. This is a remarkable collection of herpetofauna in one park unit: cold water species on montane, higher elevation slopes whereas there were Mediterrarean or "hot-adapted" reptiles in lower reaches in chaparral or open areas.

Although we conducted few night drives, these provided a fair number of snake records in LABE. We were in search on the night snake (*Hysiglena torquata*) that others have reported for this park unit, but we found no documentation on our surveys. This method is opportunistic in that evening and night searches are best after hot days when warm evenings are conductive to snake movements. These usually occur in late spring.

For those park with paved roads, patrols along roads also can yield valuable records. For example, we found 5 striped racers dead-on-the road during our studies at WHIS. Our other methods yielded only 1 observation (during a time-constrained search). Many of our TCS were conducted in WHIS in spring and high temperatures were not present. The striped racer and whiptail lizard are both adapted to warm, dry conditions.

We recommond continued use of multiple techniques to best cover the range of species in Klamath Network park units. The time-constrained search (e.g,. 2 person-hrs per site) is basic to most inventory programs, and appeared to be fairly effective for the effort expended. More specialized efforts such as stream surveys were required for coldwater, rocky streams (timed searches of three 20 min belts) as well as more open, larger streams (walking surveys along stream banks).

Employment of pitfall trapping or cover objects may be useful to locate some of the uncommon or specialized species that we did not document (e.g., the night snake). These both require an investment in materials and installation time. In particular, pitfall traps must be checked regularly (preferred daily) and, thus, are labor intensive to operate. Still, they may prove useful to locate some species of the herpetofauna now underestimated or overlooked (e.g., night snakes).

Still, estimating the relative abundance or population sizes of herpetofauna remains elusive. We need to develop effective sampling in specialized habitats and for "sensitive" or uncommon species. This will be addressed in future efforts to monitor populations over time.

There are marked differences in herpetofaunas from coastal to inland park units in the Klamath region. And, major differences in those parks with elevational gradients (e.g., WHIS).

Future Effort

Aquatic herpetofauna remain a high priority group in the Klamath Network. Several species are of management or conservation concern (State listed, now or earlierly considered for Federal listing): yellow-legged frog, red-legged frog, and western pond turtles. However, we have not located any red-legged frogs at WHIS and this frog may not have occurred in the region. Further, there is concern about the status of western toads and Cascade frogs. Conversely, little attention is directed at terrestrial species of the herpetofauna and, in most cases, we have little to no knowledge of the status of most species of reptiles.

No inventory surveys were conducted at Redwood NP because we had better general knowledge there than in other Klamath units (at least on a relative sense). This does not meant to imply we know the status of the herpetofauna at REDW. Future monitoring should have REDW as a key park due to its unique plant community in a coastal rain forest environment, and high amphibian diversity. We need to consider using REDW in the big picture: studying and tracking amphibians at REDW to compare trends to Olympic Natl Park where we have considerable information (e.g., see Adams and Bury 2001).

In 2003, we plan to spend more time surveying at CRLA, especially to better document reptile records. This montane area could be compared to LAVO as they have many species in common (e.g., Cascade frogs, western toads, lizard species).

Products and Mileposts

- A coordination meeting of Klamath biologists was held in Corvallis, OR, and we featured the herpetofauna at WHIS as a case study for the session.
- We provided copies (CD Rom) to the NPS Klamath Network of:
  Field data, summary sheets, etc.
  Photographic file listed by park and species/activity.
- Completed inventories at three park units (WHIS, LABE, ORCA) and partially (CRLA), with many ideas for monitoring and other studies in the future.

References

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Table 1. Location, number of surveys and dates of 2002 surveys at Klamath Network park units.

NPS Unit	Technique	N	Survey Dates (Mon/Date)
Whiskeytown	Terrestrial	50	**1**/16-17; **3**/13-19; 28-31; **4**/1-3, 12-17; 26, 28; **5**/13-15
	Linear hikes	7	**4**/16, 27-30; **5**/1-2
	Streams	12	**7**/18-27
Lava Beds	Terrestrial	17	**6**/7-8, 10-11, 20-25, 27
	Linear hikes	12	**6**/8, 10, 20, 21-26
	Night drives	4	**6**/20, 24-26
Oregon Caves	Terrestrial	6	**6**/4-6
	Linear hikes	2	**6**/4,6
	Streams	2	**7**/10-11
Crater Lake	Terrestrial	14	**8**/9-12

Table 2. Comparison of 2002 results from terrestrial surveys in 4 park units, Klamath Park Network.

Park Unit:	**Whiskeytown**		**Lava Beds**		**Crater Lake**		**Oregon Caves**	
No. Sites:	**50**	MEAN	**17**	MEAN	**14**	MEAN	**6**	MEAN
REPTILES								
SCOC	**127**	2.54	**87**	5.12	**0**	0.00	**0**	0.00
SCGR	**32**	0.64	**5**	0.29	**3**	0.21	**0**	0.00
EUSK	**58**	1.16	**4**	0.24	**0**	0.00	**0**	0.00
GEMU	**27**	0.54	**0**	0.00	**0**	0.00	**0**	0.00
GECO	**2**	0.04	**0**	0.00	**0**	0.00	**3**	0.50
CNTI	**0**	0.00	**0**	0.00	**0**	0.00	**0**	0.00
						0.00		
COCO	**9**	0.18	**2**	0.12	**0**	0.00	**0**	0.00
DIPU	**2**	0.04	**0**	0.00	**0**	0.00	**0**	0.00
COTE	**8**	0.16	**0**	0.00	**0**	0.00	**0**	0.00
LAZO	**1**	0.02	**0**	0.00	**0**	0.00	**0**	0.00
LAGU	**1**	0.02	**0**	0.00	**0**	0.00	**0**	0.00
MALA	**1**	0.02	**0**	0.00	**0**	0.00	**0**	0.00
MATA	**0**	0.00	**2**	0.12	**0**	0.00	**0**	0.00
THEL	**6**	0.12	**0**	0.00	**0**	0.00	**0**	0.00
THSI	**1**	0.02	**0**	0.00	**0**	0.00	**0**	0.00
THCO	**1**	0.02	**0**	0.00	**0**	0.00	**0**	0.00
PIME	**1**	0.02	**0**	0.00	**0**	0.00	**0**	0.00
CRVI	**1**	0.02	**0**	0.00	**0**	0.00	**0**	0.00
AMPHIBIANS								
AMMA	**0**	0.00	**0**	0.00	**0**	0.00	**0**	0.00
DITE	**1**	0.02	**0**	0.00	**0**	0.00	**0**	0.00
ENES	**39**	0.78	**0**	0.00	**0**	0.00	**20**	3.33
ANFE	**0**	0.00	**0**	0.00	**0**	0.00	**13**	2.17
ANFL	**2**	0.04	**0**	0.00	**0**	0.00	**0**	0.00
PLEL	**0**	0.00	**0**	0.00	**0**	0.00	**0**	0.00
ASTR	**1**	0.02	**0**	0.00	**0**	0.00	**0**	0.00
RABO	**5**	0.10	**0**	0.00	**0**	0.00	**0**	0.00
RACA	**0**	0.00	**0**	0.00	**12**	0.86	**0**	0.00
HYRE	**21**	0.42	**0**	0.00	**1**	0.07	**1**	0.17

Table 3. Comparison of 2002 results from linear surveys in 3 park units, Klamath Park Network

Park Unit:	Whiskeytown		Lava Beds		Oregon caves	
No. Sites:	**7**	MEAN	**12**	MEAN	**6**	MEAN
REPTILES						
SCOC	**42**	6.00	**145**	12.08	**0**	0.00
SCGR	**0**	0.00	**15**	1.25	**0**	0.00
EUSK	**20**	2.86	**3**	0.25	**0**	0.00
GEMU	**5**	0.71	**0**	0.00	**0**	0.00
GECO	**0**	0.00	**0**	0.00	**0**	0.00
CNTI	**0**	0.00	**0**	0.00	**0**	0.00
CHBO	**0**	0.00	**0**	0.00	**0**	0.00
COCO	**0**	0.00	**0**	0.00	**0**	0.00
DIPU	**3**	0.43	**0**	0.00	**0**	0.00
COTE	**0**	0.00	**0**	0.00	**0**	0.00
LAZO	**0**	0.00	**0**	0.00	**0**	0.00
LAGU	**1**	0.14	**0**	0.00	**0**	0.00
MALA	**0**	0.00	**0**	0.00	**0**	0.00
MATA	**0**	0.00	**1**	0.08	**0**	0.00
THEL	**4**	0.57	**0**	0.00	**0**	0.00
THSI	**0**	0.00	**0**	0.00	**0**	0.00
THCO	**0**	0.00	**0**	0.00	**0**	0.00
PIME	**0**	0.00	**0**	0.00	**0**	0.00
CRVI	**0**	0.00	**2**	0.17	**0**	0.00
AMPHIBIANS						
ENES	**24**	3.43	**0**	0.00	**13**	2.17
ANFE	**0**	0.00	**0**	0.00	**0**	0.00
ANFL	**0**	0.00	**0**	0.00	**0**	0.00
PLEL	**0**	0.00	**0**	0.00	**0**	0.00
DITE	**0**	0.00	**0**	0.00	**0**	0.00
AMMA	**0**	0.00	**0**	0.00	**0**	0.00
RABO	**6**	0.86	**0**	0.00	**0**	0.00
HYRE	**2**	0.29	**0**	0.00	**0**	0.00
RACA	**0**	0.00	**0**	0.00	**0**	0.00
ASTR	**0**	0.00	**0**	0.00	**0**	0.00

Table 4. Comparison of 2002 results from stream surveys in 2 park units, Klamath Park Network

Park Unit:	Whiskeytown	Oregon Caves

Survey type:	Large Water		Headwater		Total surveys		Headwater	
No. Sites:	**4**	MEAN	**8**	MEAN	**12**	MEAN	**6**	MEAN
AMPHIBIANS								
ASTR	**2**	0.5	**50**	6.25	**52**	4.33	**6**	1.00
RABO	**7**	1.75	**7**	0.88	**14**	1.17	**0**	0.00
HYRE	**5**	1.25	**0**	0.00	**5**	0.42	**0**	0.00
DITE	**7**	1.75	**51**	6.38	**58**	4.83	**9**	1.50
ANFL	**3**	0.75	**18**	2.25	**21**	1.75	**0**	0.00
ENES	**2**	0.5	**1**	0.13	**3**	0.25	**0**	0.00
REPTILES								
SCOC	**0**	0	**1**	0.13	**1**	0.08	**0**	0.00
CRVI	**0**	0	**1**	0.13	**1**	0.08	**0**	0.00
GEMU	**0**	0	**1**	0.13	**1**	0.08	**0**	0.00
THEL	**1**	0.25	**0**	0.00	**1**	0.08	**0**	0.00